PRELIMINARY EVALUATION OF THE JUNE 2002 VERSION OF CMAQ

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1. INTRODUCTION

The latest version of EPA's Community Multiscale Air Quality model was released during June of this year. As part of this release, a preliminary evaluation was performed involving numerous model configurations, resolutions and domains. For the sake of brevity only the "base" configuration (defined below) will be presented. The evaluation, which covered a two week period (1–14 July) during 1999, utilized ambient air concentration data of nine species (O_3, SO_2, NO_3^-, HNO_3, $PM_{2.5}$, EC, OC, SO_4^-, and NH_4^+) obtained from three nationwide networks: AIRS, CASTNet and IMPROVE. A suite of metrics was used in the evaluation, including summary statistics and numerous measures of bias and error.

2.0 CMAQ CONFIGURATION

The CMAQ "base" configuration examined in this abstract uses the SAPRC99 gas-phase chemistry mechanism with the AE3 aerosol module and BEIS 3.09 biogenic emissions. The simulation was performed using a 32 km resolution for the U.S. domain.

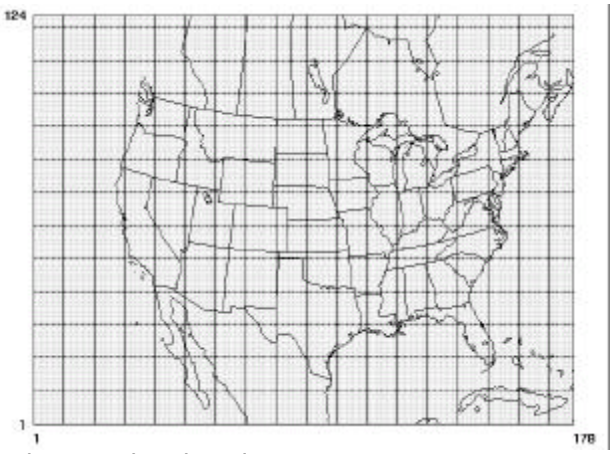

Fig. 1 32 km domain

* On assignment from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce

3.0 EVALUATION DATA SETS

3.1 AIRS

Hourly O_3 (ppb) data obtained from EPA's Aerometric Information Retrieval System (AIRS) were used in the evaluation. Over 1000 stations were available, mostly in urban areas, resulting in over 300,000 observations. In addition to the hourly data, both the maximum 1-hr and maximum 8-hr concentrations were calculated for each station and each day over the two week evaluation period.

3.2 CASTNet

Weekly average concentrations of SO_2, SO_4^{2-}, NO_3, HNO_3 and NH_4^+ ($\mu g\ m^{-3}$) obtained from the Clean Air Status and Trends Network (CASTNet) were also available for 60, mostly rural stations Unfortunately, only one collection period (6-13 July) coincided with the simulation period.

3.3 IMPROVE

Daily average concentrations of SO_4^{2-}, NO_3, $PM_{2.5}$, OC and EC ($\mu g\ m^{-3}$) from 50 rural IMPROVE (Interagency Monitoring of PROtected Visual Environments) sites were also used. These data are collected on every third day, (midnight to midnight, local time), limiting the number of days available for comparison to 4 (July 3, 7, 10, 14).

4.0 STATISTICS

Numerous measures of both bias and error were calculated for each species. For bias, Mean Bias (MB), Mean Normalized Bias (MNB), Normalized Mean Bias (NMB) and Mean Fractional Bias (MFB) were calculated. For error, we examined Normalized Mean Error (NME),Mean Absolute Gross Error (MAGE), Mean Normalized Gross Error (MNGE) and Root Mean Square Error (RMSE).